

WHAT IS CLAIMED IS:

1. A process for modifying a synthetic silica powder, the process comprising placing in a vacuum vessel a synthetic silica powder produced by a sol-gel process; heating the synthetic silica powder while evacuating the vacuum vessel; introducing into the vacuum vessel an atmosphere comprising helium; heating the synthetic silica powder in the atmosphere comprising helium in the vacuum vessel to a heating temperature in a range of from a degas temperature of the synthetic silica powder to a sintering temperature of the synthetic silica powder; and, after the heating, cooling the synthetic silica powder in the atmosphere comprising helium.
2. The process according to Claim 1, wherein the degas temperature is 700°C; the sintering temperature is 1400°C; and the synthetic silica powder is cooled in the atmosphere comprising helium to a temperature of 400°C or less.
3. The process according to Claim 1, wherein the heating temperature is in a range of from 800°C to 1200°C.
4. The process according to Claim 1, wherein the helium introduced into the vacuum vessel has a dew point of -50°C or less.
5. The process according to Claim 1, wherein the heating is at a pressure of 5 Pa or less.
6. The process according to Claim 1, wherein the vacuum vessel is a vacuum furnace.
7. The process according to Claim 6, wherein the process further comprises evacuating the vacuum furnace to a pressure of 5 Pa or less.

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8. The process according to Claim 6, wherein the process further comprises evacuating the vacuum furnace to a pressure of 5 Pa or less while the synthetic silica powder is maintained a temperature in a range of from the degas temperature to the sintering temperature.

9. A modified synthetic silica powder produced by the process of Claim 1.

10. A crucible used for the production of single crystals, the crucible comprising a quartz glass layer forming an inside surface of the crucible, wherein the quartz glass layer is produced by a process comprising fusing the modified synthetic silica powder of Claim 9.

11. The crucible according to Claim 10, wherein the quartz glass layer is transparent.

12. The crucible according to Claim 11, wherein the inside surface includes a bottom part and a side wall part; the quartz glass layer has a thickness of less than 0.5 mm; and a bubble content of the quartz glass layer before use is 0.1 volume % at the bottom part and 0.3 volume % at the side wall part.

13. The crucible according to Claim 11, wherein the inside surface includes a bottom part and a side wall part; the quartz glass layer has a thickness of less than 0.5 mm; and a bubble content of the quartz glass layer after use is 5 volume % at the bottom part and 10 volume % at the side wall part.

14. A process for modifying a synthetic silica powder, the process comprising providing an amorphous synthetic silica powder produced by a sol-gel process; heating the synthetic silica powder in a vacuum furnace to a heating temperature in a range of from 700°C to 1400°C;

maintaining the synthetic silica powder in the vacuum furnace in the range of from 700°C to 1400°C while evacuating the vacuum furnace to a pressure of 5 Pa or less; introducing into the vacuum furnace helium having a dew point of -50°C or less; cooling the synthetic silica powder in the helium in the vacuum furnace to 400°C or less to form a modified synthetic silica powder; and bringing the modified synthetic silica powder out of the vacuum furnace into air.

15. The process according to Claim 14, wherein the heating temperature is in a range of from 800°C to 1200°C.

16. A modified synthetic silica powder produced by the process of Claim 14.

17. A crucible used for the production of single crystals, the crucible comprising a quartz glass layer forming an inside surface of the crucible, wherein the quartz glass layer is produced by a process comprising fusing the modified synthetic silica powder of Claim 16.

18. The crucible according to Claim 17, wherein the quartz glass layer is transparent.

19. The crucible according to Claim 18, wherein the inside surface includes a bottom part and a side wall part; the quartz glass layer has a thickness of less than 0.5 mm; and a bubble content of the quartz glass layer before use is 0.1 volume % at the bottom part and 0.3 volume % at the side wall part.

20. The crucible according to Claim 18, wherein
the inside surface includes a bottom part and a side wall part;
the quartz glass layer has a thickness of less than 0.5 mm; and
a bubble content of the quartz glass layer after use is 5 volume % at the bottom part
and 10 volume % at the side wall part.